

Mitigation Proposal

FINAL DRAFT

Control of
Off-Site and Bystander
Short-Term Exposure to

Methyl Isothiocyanate (MITC)

From
Metam Sodium and Metam Potassium Applications

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Executive Summary

Introduction

This document outlines the Department of Pesticide Regulation's (DPR) proposed strategy to mitigate acute (short-term) off-site exposure to metam sodium and other methyl isothiocyanate (MITC)-generating pesticides, as identified in the Department's Risk Characterization Document (Rubin, 2002). DPR is seeking input from external stakeholders on this proposal and therefore, it should not be considered a final departmental position.

DPR has drafted risk management measures to meet its regulatory goal to ensure that the use of metam sodium and other MITC-generating pesticides do not result in exposures that cause recognizable eye or respiratory irritation (MITC Risk Management Directive, December 2002). DPR is proposing these control measures in response to listing MITC-generating pesticides as Toxic Air Contaminants (TAC). By ensuring that no one experiences exposure to MITC that results in the onset of minor, reversible effects (noticeable eye or respiratory effects), we can be confident that severe health effects are prevented. Illness incidents, whether to individuals, groups of workers, or neighborhoods, are unacceptable and people need to be adequately protected. To accomplish this will require establishing clear, unambiguous rules and increasing the current set of restrictions. DPR is also seeking input on ways to reduce volatile organic compound (VOC) emissions into the atmosphere. DPR may revise this mitigation proposal after completing its evaluation of VOC emission reduction strategies.

Scientific and Regulatory Basis

Metam sodium quickly breaks down into a number of compounds. One of those compounds, MITC, can pose a significant health hazard and has resulted in a number of illness incidents. Exposure to MITC can quickly escalate from a relatively minor nuisance to a significant acute health effect. The exposure levels capable of causing reversible irritation occur at levels lower than more severe adverse effects. DPR has identified in its risk assessment levels below which no adverse health effects would likely occur. The risk assessment also describes exposure at which MITC can be expected to cause mild reversible eye and respiratory irritation. This information provides an indication of exposures at which no adverse effects can be expected, and has guided our conclusion that adequate public health protection is achieved if mitigation measures prevent the onset of irritation. Applicators and regulators have extensive experience with thousands of applications where no irritation occurred, as well as a limited number of incidents where applications resulted in minor and major adverse impacts. The real life situations provides empirical information to guide our control measures.

The scientific basis of our control measures comes from DPR's completed TAC document. In the TAC document, staff determined that metam sodium and other MITC-generating pesticides could result in unacceptable acute and seasonal exposures. The illness incidents demonstrate the hazards posed from pesticides that generate MITC. The TAC document identified a Reference Exposure Level (REL) of 22 parts per billion (ppb)

over one hour for acute exposures. An REL is a concentration below which no adverse health effects are anticipated. For MITC, the acute REL was determined from a human study that limited MITC exposure only to the subjects' eyes. In that study, the no observed effect level (NOEL), the level where no statistically significant adverse effects were seen, was 220 ppb for exposures up to eight hours. The REL was determined by taking the NOEL and including a ten-fold factor to address intrahuman variability. The lowest dose at which effects were seen, also known as the lowest-observable effect level, was 800 ppb. Subjects exposed to 800 ppb for one to two hours were reported to have a statistically significant increase in eye blink rate, and the majority of subjects reported eye irritation. The effects seen at 800 ppb represent the onset of reversible, mild health effects, while acknowledging that the small number of subjects inherently limits this human study, and that the group may not adequately represent the most sensitive individuals. This type of effect is what we seek to avoid.

Before DPR can achieve its goal of eliminating the onset of mild irritation, we must ensure that major illness incidents are prevented. Illegal applications have been the major cause of illness incidents. DPR has seen that failure to follow existing restrictions can have significant short-term health impacts on individuals and communities. An important aspect of our regulatory approach was to develop restrictions that are clear, unambiguous, and foster compliance. Clarifying rules to improve compliance would greatly reduce the likelihood of illness incidents. The existing rules (i.e., labeling and permit conditions), if followed, significantly lessen illness incidents and the onset of mild effects. However, as DPR has seen from some of the incidents, the existing rules under certain conditions provide an inadequate safety margin to achieve our goal of eliminating the onset of mild effects.

In preparing restrictions, DPR focused on a number of critical and interdependent factors that affect the magnitude and duration of off-site air concentrations. These factors include an appropriate distance from sensitive sites, weather conditions, amount per acre applied, acres treated, soil moisture and post application watering. DPR staff evaluated how these factors were part of existing labeling and permit conditions. Current restrictions imposed through labeling and permit conditions significantly lessen the onset of mild irritation but do not provide an adequate safety margin in all cases. DPR sought to strengthen these factors to provide adequate public health protection.

Quantifying how well restrictions met our goals under certain meteorological scenarios poses unique technological challenges. MITC can cause adverse health effects in the very short period of time of exposure (e.g., minutes) while the source (off gassing) can occur over a much longer period (one to two days) and in a non-uniform rate. Ideally, we would like to be able to monitor instantaneous peak exposures of MITC and be able to model instantaneous peak exposures. This effort would be consistent with our established standard protocol to model fumigant air levels based on specific practices, meteorological parameters and off gassing rates. Unfortunately, the current methodology reviewed by DPR does not work well when presented with evaluations for durations less than one hour. Irregardless, the use of these analytical tools can still provide insights to quantifying the protections we are seeking.

Although our goal is to reduce exposures at or below the level of the REL (22 ppb), our methodology to quantify exposure levels for short durations with scientific certainty is unattainable. Therefore, DPR relied on a qualitative approach to evaluate existing rules and incident data, monitoring data under different use conditions, and modeling tools to increase the use restrictions. DPR was able to evaluate the increased use restrictions using sophisticated analytical modeling tools utilizing various predictive assumptions. For the modeling evaluation, we considered several exposure target values for MITC over different time periods. We utilized various modeling approaches with different input variables to ensure that the likelihood of causing the onset of recognizable eye or respiratory irritation is remote. We also compared the predicted modeling results to the experience from the 3,000-4,000 metam sodium applications per year under the existing rules, confirmed that these increased use restrictions will achieve our goal of providing adequate public health protection.

Scope of Mitigation Strategy

The proposal discusses the potential for acute off-site exposure to MITC from applications of MITC-generating pesticides (metam sodium and metam potassium) in the agricultural setting. The application methods addressed in this proposal include sprinkler and soil injection (i.e., shank), which make up a majority of the uses. This mitigation proposal does not address the minor uses of non-agricultural applications such as sewer pipe and utility pole treatments, or flood, drip and rotary tiller applications in the agricultural setting. These application methods will be evaluated after a review of monitoring data has been completed. This proposal does not address applications of the pesticide dazomet. DPR plans to address dazomet in a separate mitigation proposal, depending on a review of data and the United States Environmental Protection Agency's (U.S. EPA) action to mitigate its use.

Mitigation Proposal

This mitigation proposal has been generated after an extensive review of current registered uses, application methods, historical use patterns, and incident cases. Prior to finalizing this document, DPR consulted with staff from the Office of Environmental Health Hazard Assessment, the California Department of Food and Agriculture, the Air Resources Board, the Air Pollution Control Districts, and county agricultural commissioners (commissioners). DPR is seeking input from pesticide applicators, growers, farm workers, community groups, and other interested parties.

While some of the requirements in this MITC mitigation proposal, particularly application and environmental restrictions are documented on product labels, a number of inconsistencies currently exist. It is anticipated that this proposal will serve to establish uniform standards. Inasmuch as these proposed use guidelines and restrictions are based on the best available information, it is anticipated that additional data may lead to future modifications. The registrants have recently completed or plan to conduct studies that will cover other labeled applications such as flood chemigation, drip tape, and rotary tiller methods. These methods are presently being researched and/or evaluated. DPR will address these other application methods after additional field data is generated and reviewed.

General Requirements for Metam Sodium/Potassium (i.e., Metam) Applications (Sprinkler and Soil Injection/Shank)

I. Worksite Plan

In addition to the requirements of section 6428, the grower would be required to submit a proposed worksite plan to the commissioner for evaluation at least 7 days prior to submitting a notice of intent. The proposed worksite plan would include, method of application to be used, acreage and identification of each application block to be treated, application rate to be used, the number of post-application water treatments scheduled, a description of the notification procedure to property operators pursuant to section VI, and any other information required by the commissioner. The commissioner would be required to retain the proposed worksite plan for one year after the expiration of the permit.

DPR is seeking input on whether this proposed restriction is necessary for commissioners to adequately evaluate the conditions at the site to determine buffer zones distances. DPR is interested in receiving input on the impact of this proposed requirement and whether there are any alternative approaches.

II. Work Activity Restrictions

Growers would be required to take reasonable steps to ensure employees of any neighboring property operators who are producing an agricultural commodity do not perform any activities, other than fumigation handling activities, in the buffer zone during its duration. DPR is considering the following restriction:

- Growers that have a buffer zone extended into adjoining agricultural property would be required to obtain written permission from the adjoining property operator to post the buffer zone while it is in effect. Signs would be posted during the duration to indicate “restricted entry” at intervals not exceeding 200 feet, visible to persons with normal vision at a distance of 25 feet, and contain the words: “Metam Sodium Buffer Zone”, “Keep Out” and “No Entre.”

Exception: No posting would be required if the adjoining agricultural property can assure the grower that no employees will be on the property during the buffer zone duration.

DPR is seeking input on whether this proposed restriction is an effective risk management tool to adequately protect workers not involved in the application process from MITC exposures. DPR is interested in receiving input on the impact of this proposed requirement and whether there are any alternative approaches.

III. Occupied Structures and Bystander Area Restrictions

Growers are currently required to identify on the restricted materials permit all known areas that could be adversely impacted by the use of the restricted material (e.g., Metam). To meet this requirement, growers would specifically be required to provide a map or description of all occupied structures that would be ½ mile

from the application site. Growers would also be required to provide a map or description of all bystander areas (e.g., parks, playgrounds, lakes, reservoirs, bus stops, or other similar areas, including locations where persons not involved in the application may be exposed), as defined by the commissioner, that would be ½ mile from the application site. The commissioner would evaluate the information to determine whether feasible mitigation measures are in place.

Growers and their pest control adviser must also consider alternatives to the use of the restricted material (e.g., metam) before applying for a permit. The commissioner should ask the permit applicant to identify the alternatives that were considered and document his/her response. If the permit applicant acknowledges they did not consider alternatives, the commissioner should refuse to issue the permit at this time and direct them to comply with 3 CCR section 6426 (Alternatives and Mitigation Measures).

The commissioner, pursuant to section 6432, shall evaluate local conditions and the proposed worksite plan. The commissioner shall include at least the following when conditioning a permit: the buffer zone requirements, notification requirements, and any other restrictions to address local conditions. The commissioner shall complete the evaluation and complete conditioning the permit prior to the submission of the notice of intent.

DPR is seeking input on whether this approach is an effective risk management tool in adequately protecting residents/bystanders from MITC exposures. DPR is interested in receiving input on an appropriate distance from the treatment site to identify possible occupied structures and bystander areas. DPR is also interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

IV. Notice of Intent Requirements

DPR is proposing to extend the time period for the commissioner to receive the NOI from the current 24 hours to a minimum of 48 hours prior to commencing the application, unless otherwise specified by the commissioner. This will provide commissioners with additional time to adequately evaluate the NOI and revise the mitigation measures for each application.

DPR is proposing to expand the requirements to include the following information:

- The number of blocks to be treated and acreage for each block
- The time (e.g., 4- or 8-hour block) each application block is intended to commence
- Application method to be used
- The number of post application water treatments scheduled (i.e., one, two or three)
- The certified applicator's telephone number made available 24-hours per day

DPR is seeking input on the time period and additional information required to make this an effective mitigation strategy. DPR is also interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

V. Buffer Zone Determination and Restrictions

The commissioner would designate buffer zone distances and durations based upon information provided in the worksite plan, permit, and NOI; the buffer zone tables in Appendix IV; and his or her knowledge of local conditions, including a site evaluation (if conducted). The commissioner would have the ability to use his or her discretion to establish a different standard for designating buffer zones based on local conditions. DPR is proposing buffer zones based on monitoring data, off-site exposure modeling, and effective mitigation measures currently required by commissioners. DPR is proposing to require a minimum buffer zone of 200 feet and a maximum buffer zone of ½ mile. The maximum buffer zone distance is proposed based on the ability to manage and enforce large buffer zones, the need to add a higher level of certainty to the restrictions by reducing large acreage applications at the higher rates, and DPR's knowledge of incidents involving large acreage treatments. The time selected for buffer zone durations (e.g., 24 hours for sprinkler and shank when two or more post application water treatments are made; and 48 hours when one post application water treatment is made) are based on monitoring data and estimated peak emissions that come off the field over time.

Buffer Zone Requirements

Growers would be required to assure that no persons are allowed within the buffer zone, except to transit and perform fumigation-handling activities.

Growers and pest control businesses applying Metam would be responsible for the following:

- Complying with buffer zones determined by the commissioner. The commissioner would determine the appropriate buffer zone distance based on the application method, pounds active ingredient applied per acre, acreage treated, the number of post application water treatments required, local conditions, and the buffer zone tables in Appendix IV.
- Sprinkler application acreage limitations: Maximum of **25 acres** in a sensitive area (the distance to occupied structures or bystander areas that are ¼ mile or less); and a maximum **50 acres** in a standard area (the distance to occupied structures or bystander areas that are greater than ¼ mile).
- Shank application acreage limitations: Maximum of **40 acres** in a sensitive area (the distance to occupied structures or bystander areas that are ¼ mile or less); and a maximum **80 acres** in a standard area (the distance to occupied structures or bystander areas that are greater than ¼ mile).

- Occupied Structures - The buffer zone distance would be measured from the perimeter of the application block to the closest point of the occupied structure's property line, unless the commissioner determines that the buffer zone should apply to the occupied structure. The commissioner would need to consider how the property is being used, and whether persons will be present while the buffer zone is in effect. Occupied structures include residences, employee housing, businesses, schools, convalescent homes, hospitals, or other similar sites determined by the commissioner.
- Bystander Areas - The buffer zone distance would be measured from the perimeter of the application block to the closest point of the area where bystanders may be present. The commissioner would need to consider how the property is being used, and whether persons will be present while the buffer zone is in effect.
- The buffer zone restrictions would begin at the start of fumigation and remain in effect for 24 hours for sprinkler and soil injection (shank) applications when a minimum of two post application water treatments are made; and 48 hours for sprinkler and soil injection (shank) when one post application water treatment is made.
- The buffer zone would not extend into adjoining property unless growers take reasonable steps to ensure employees of any neighboring property operators who are producing an agricultural commodity do not enter the buffer zone during its duration (see section II)
- With approval from the commissioner, the buffer zone may extend across sites only where transit activities may occur, including streets, roads, roads within agricultural property, highways, and other similar sites of travel. Written permission and posting requirements would not apply.

DPR is seeking input on whether this approach is an effective risk management tool in adequately protecting residents and bystanders from MITC exposures. Are the buffer zones appropriate? If not, why? Are the time periods appropriate and workable? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches. DPR is in the process of evaluating VOC emission reduction strategies and may need to revise buffer zone restrictions after the evaluation is completed.

VI. Notification to Property Operators

Growers would be required to notify schools, residences, hospitals, convalescent homes, onsite employee housing, or other similar sites identified by the commissioner within 300 feet from the perimeter of the buffer zone that a Metam application is scheduled to occur near their property. Notification would be in writing, in both English and Spanish, or by other means approved by the commissioner. Growers would be required to deliver the notification no later than the same day as the submission of the worksite plan. The notification shall include the following information:

- The name of the chemical(s) to be applied
- The grower's name, business address, and business telephone number

- The commissioner's name, business address, and business telephone number
- The earliest and latest dates that the fumigation will start
- Instructions on how to obtain additional information about the fumigation schedule from the grower at least 24 hours prior to the application

If the fumigation of an application block does not commence within the timeframe specified, then a new notification must be provided.

DPR is seeking input on a notification requirement. DPR is proposing notification to ensure people near a fumigation site are aware of the application and can contact the grower for more information about the fumigation schedule, or report a complaint to the commissioner. Should DPR consider adopting the same notification requirements as methyl bromide? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

VII. MITC Control Plan and Procedures

DPR is proposing to require growers to submit a completed MITC Control Plan (Appendix I) to the commissioner. This Plan is also intended to meet the requirements of an accidental response plan as specified in section 6780. Growers would also need to provide a copy of the Plan to the pest control business and have it available at the work site while Metam application and post-application (e.g., monitoring period) work activities are being performed. The Plan is intended to establish effective procedures to supervise the application and respond to situations where odors of Metam are detected away from the application site or symptoms are reported.

DPR is seeking input on the contents of the Plan. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

DPR is proposing the following requirements to implement a MITC Control Plan to suppress off-site movement of MITC:

1. For applications where the application block is ¼ mile or less from occupied structures or bystander areas, the application block size to be treated would be limited to the sprinkler irrigation equipment watering capabilities.
 - Establish a time interval of 24 hours post-application for the irrigation equipment and water to be available.

DPR is seeking input on the time interval. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

- The irrigation equipment would need to deliver at least 0.25 inch of water over the treatment site within 3 hours.

DPR is seeking input on whether the water capability of 0.25 inch over three hours is consistent with current irrigation equipment capabilities and appropriate. If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

2. For applications where the application block is greater than ¼ mile but less than ½ mile from occupied structures or bystander areas, irrigation equipment and water shall be available for 24 hours post application, in an amount sufficient to provide at least 0.25 inch of water over the treatment site within 4 hours.

DPR is not proposing to require irrigation and watering capabilities for applications ½ mile or greater from sensitive areas. DPR is seeking input on the time interval. DPR is seeking input on whether the water capability of 0.25 inch over four hours is consistent with current irrigation equipment capabilities and appropriate. If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

3. DPR would establish requirements for growers and pest control businesses to follow if odors were detected or symptoms reported. DPR is considering the following requirements:
 - Cease the application immediately.
 - Employees would need to wear the personal protective equipment required by the labeling, including a full-face respirator or half-face respirator with non-venting goggles.
 - Follow the MITC Control Plan procedures.
 - Apply water immediately as follows: 0.25 inch of water is applied uniformly over the application block in a sensitive area within 3 hours, or 0.25 inch of water is applied uniformly over the application block in a standard area within 4 hours (post application water treatments would not be required when the application block is ½ mile or greater from an occupied structure or bystander area).
 - Notify the commissioner within 1 hour of the initiation of the response.
 - Obtain authorization from the commissioner prior to restarting any application that has been ceased due to a response.

DPR is seeking input on when to initiate the plan and the procedures to follow. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

VIII. Soil Preparation

DPR plans to establish soil preparation requirements to ensure the field is prepared properly using tillage techniques for efficacy and minimizing off-site movement. These requirements may include the following:

- Loosen the soil to the depth of the planned treatment zone.
- Break up the soil crust and clods.
- Keep crop residual to a minimum. Residue (e.g., stalks, foliage, root crowns) from the previous crops shall be thoroughly incorporated into the soil to avoid interference with the application. Any crop residual pulled by the shanks to the ends of the field must be removed before making the turn for the next pass.

DPR is considering establishing a one to two-inch in diameter standard for clods in approximately 75-85% of the field. Is this consistent with standard practices and appropriate? If not, why? DPR is requesting input to help define a standard for minimum crop residual.

IX. Application Rate

Metam Sodium: DPR would limit the application rate to a broadcast rate of 320 pounds active ingredient or 75 gallons of product (42% active ingredient) per acre for metam sodium sprinkler and shank applications.

Metam Potassium: DPR would limit the application rate to a broadcast rate of 350 pounds active ingredient or 60 gallons of product per acre for metam potassium sprinkler and shank applications.

DPR is seeking input on the application rates for metam sodium and metam potassium. DPR is interested in seeking input on whether to limit the shank method to bedded applications only (i.e., 160 pounds active ingredient of metam sodium; 175 pounds active ingredient of metam potassium) to reduce exposures. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

X. Soil Moisture

Soil moisture is a critical factor in reducing off-site exposures of MITC, and important for efficacy. DPR is proposing to require growers to monitor the soil moisture content in the treatment zone on the day of the scheduled application to ensure it is in the range of 50-80% of field capacity. DPR would require the soil moisture content to be determined using one of the following: (1) soil water tensiometer measurement; or (2) squeeze method, USDA 1998 (Appendix II).

DPR is interested in knowing whether the soil moisture testing methods can be used. If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XI. Soil Temperature

DPR is proposing to require growers or pest control businesses to monitor the soil temperature once in the treatment zone on the day of application, at a depth of three inches. DPR believes soil temperature is a factor that impacts efficacy and may impact soil moisture content and MITC volatilization. DPR would allow the

use of metam sodium/potassium when the soil temperature is at or between 40° F and 90° F. Applications would be prohibited when the soil temperature, at a depth of three inches, is below 40° F and above 90° F.

DPR is seeking input on the temperature restrictions selected. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XII. Wind Speed

DPR is considering wind speed restrictions for sprinkler applications only. (See Specific Requirements for Sprinkler Applications, section II)

XIII. Time of Application

DPR is proposing to establish a time period when Metam could be applied. Applications during calm periods (e.g., nighttime) when inversions are more likely to occur can result in increasing concentrations of off-site exposures. Therefore, DPR is proposing that applications **start no earlier than one hour after sunrise** and are **completed no later than one hour before sunset**. (Note: Applications would need to be completed earlier than one hour before sunset to meet the Post Application Water Treatment Requirements specified in XVI.)

DPR is seeking input on the time period selected and whether any exceptions to the proposal should be considered. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XIV. Multiple Block Applications

DPR is proposing to place additional restrictions on contiguous application blocks that are treated sequentially over more than one day. The commissioner would determine the buffer zone distance based on the total acreage to be treated each consecutive two-day period, unless 48 hours have elapsed between the start of each sprinkler application (minimum of one post application water treatment) and shank application (minimum of two post application water treatments). A 72-hour time period would be required for shank applications with only one post application water treatment. The application blocks would need to be treated in a sequence that moves away from sensitive sites.

DPR is seeking input on whether this approach is an effective risk management tool in reducing off-site movement. Are 48 or 72 hours an adequate time periods to address cumulative effects of off-site movement from two adjacent treated fields? If not, why? DPR is considering reducing the 72-hour period for shank applications (one post application water treatment) to 48 hours if 160 pounds or less of active ingredient are used. Although not proposed, DPR is also seeking input on restricting applications that are in close proximity to each other. For applications that may occur at the same time, should DPR establish a distance restriction from nearby application blocks to address potential cumulative effects? If not, why? If so, what distance is appropriate? As an alternative to a distance

restriction, what is an appropriate time separation for applications? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XV. Application and Post-Application Monitoring

As mentioned previously, soil moisture and temperature conditions are factors in managing off-site movement of MITC. Therefore, DPR is proposing to require growers and pest control businesses to monitor and document weather and soil conditions, irrigation specifications, and watering practices during and after the application using the Metam Sodium/Potassium Monitoring Form (Appendix III). The application monitoring requirements would include:

- Measure weather conditions (i.e., wind speed, wind direction, and air temperature) at the work site prior to the application and hourly thereafter until the end of the application.
- Measure soil conditions (i.e., soil moisture and soil temperature) immediately prior to the application of metam sodium/potassium.
- Document irrigation specifications (i.e., water pressure, irrigation rate, irrigation set number) immediately prior to the application of metam sodium/potassium.
- Document any unusual conditions (e.g., odor, equipment failure) observed at the work site. Record any observation findings at the start of application and hourly thereafter until the end of the application. The grower and pest control business would need to follow the requirements in the MITC Control Plan and Procedures (VII. MITC Control Plan and Procedures) if a condition warrants a response.

The post-application requirements would include:

- Measure weather conditions (i.e., wind speed, wind direction) at the work site at 2-hour intervals, starting 2 hours after completing the application, for a total of twelve hours (6 measurements).
- Document post-application watering information (water application start and completion date and time, amount applied in inches, comments) immediately following the post applications water treatments.
- Document any unusual conditions (e.g., dry soil conditions, odor, irrigation equipment failure) observed at the work site. The observations shall be recorded at 2-hour intervals, starting 2 hours after completing the application, for a total of twelve hours (6 observations). The grower and pest control business would need to follow the requirements in the MITC Control Plan and Procedures (VII. MITC Control Plan and Procedures) if a condition warrants a response.

DPR is seeking input on the monitoring requirements and its usefulness in managing off-site movement of MITC. Are the criteria proposed appropriate? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XVI. Post Application Water Treatment Requirements

DPR is proposing post application water treatment requirements for sprinkler and soil injection (i.e., shank) applications based on the distance from sensitive areas. As mentioned previously, water plays a critical role in suppressing off-site movement of MITC and reducing VOC emissions. DPR is proposing more stringent requirements for applications near sensitive areas based on the proximity of people to application blocks.

Sensitive Areas: Areas where an application block is 1/4 mile or less from occupied structures (e.g., residences, employee housing, businesses, schools, convalescent homes, hospitals), bystander areas, and other similar sites determined by the commissioner.

(Minimum of three post application water treatments required, except as provided below.) Growers would be required to apply a minimum of 0.25 inch of water to the treated application block through the sprinkler system starting within 30 minutes of completion of the Metam application, and finishing within three hours of the start of the post application water treatment process. Growers would need to apply an additional 0.25 to 0.5 inch of water to the treated application block starting no earlier than one hour prior to sunset on the day of application, and finishing within three hours (6 hours for 0.5 inch of water) of starting the post application water treatment process by midnight. The 0.25 to 0.5 inch range is proposed to address conditions where the soil moisture content does not decrease rapidly over time. The amount of water to be used would be based on the soil type and moisture content, and air and soil temperature at time of application. After the second post application water treatment, growers would need to apply a third water treatment of 0.25 inch of water to the treated application block one hour prior to sunset on the second day from the completion of the Metam application, and finish within three hours of starting the third water treatment by midnight. An exception to the third post application water treatment is proposed below.

Standard Areas: Areas where an application block is greater than 1/4 mile from occupied structures (e.g., residences, employee housing, businesses, schools, convalescent homes, hospitals), bystander areas, and other similar sites determined by the commissioner.

(Minimum of two post application water treatments required, except as provided below.) Growers would need to apply a minimum of 0.25 inch of water to the treated application block through the sprinkler system starting within one hour of completion of the Metam application, and finishing within four hours of starting the post application water treatment process. Growers would need to make a second post application water treatment of 0.25 to 0.5 inch to the treated application block no earlier than one hour prior to sunset on the day of application, and finishing within four hours of starting the post application water treatment process by midnight, except as provided below. The 0.25 to 0.5 inch

range is proposed to address conditions where the soil moisture content does not decrease rapidly over time. The amount of water to be used would be based on the soil type and moisture content, and air and soil temperature at time of application.

Exceptions

- The commissioner would have an option to eliminate a third post application water treatment requirement in sensitive areas based on an evaluation of the soil type and moisture content, air and soil temperature at time of application, and knowledge of other local conditions and effective control measures previously used.
- The commissioner would have the option to eliminate the second post application water treatment requirement in standard areas if the distance to the sensitive site is ½ mile or greater, and based on knowledge of effective control measures previously used.
- Between November 1 and March 31, post application water treatment(s) would not be required following soil injection (i.e., shank) applications in standard areas under the following conditions:
 - Metam is banded using a width 14 inches or less.
 - The maximum application rate is 60 pounds active ingredient per acre (14 gallons metam sodium).
 - The injection depth is 3-6 inches.
 - A soil capping method is utilized by placing a minimum of 4 inches of soil on top of the bed over the band treatment and compacted using a mechanical device (compaction roller).

Post application water treatments would be required for this application method used between April 1 and October 31.

DPR is seeking input on whether this approach is an effective risk management tool in reducing off-site movement. Is the watering standard and timing appropriate and workable? If not, why? What criteria should be used to address conditions where soil moisture remains high? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

XVII. Application and Post-Application Restrictions Near Schools

DPR is considering the following additional restrictions for applications near schools:

- Require a minimum ¼ mile buffer zone. The buffer zone distance would be measured from the perimeter of the application block to the property line, unless the commissioner determines that the buffer zone should apply to the closest school building, play area, or other sites used by faculty, students, or community members. The commissioner should consider how the property is being used, and whether persons will be present while the buffer zone is in effect.

- Sprinkler application acreage limitations: Maximum of **25 acres** within a 24-hour period when applications are made ¼ to 1 mile from a school; and no additional restrictions when applications are made greater than 1 mile from a school.
- Shank application acreage limitations: Maximum of **40 acres** within a 24-hour period when applications are made ¼ to 1 mile from a school; and no additional restrictions when applications are made greater than 1 mile from a school.
- Follow the Post Application Water Treatment Requirements following Metam applications (section XVI) for sensitive areas when applications are made ¼ to 1 mile from a school.
- Monitor the wind speed and wind direction, any unusual conditions observed at the work site after the application of Metam has been completed, and every 2 hours post application for a 48-hour period. The information specified above would be documented on the Metam Sodium/Potassium Monitoring Form (Appendix III).

DPR is seeking input on these additional restrictions when applications would occur near schools, and whether the buffer zones are adequate. If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

Specific Requirements for Sprinkler Applications

I. Air Temperature

Growers or pest control businesses applying Metam would be required to monitor the air temperature at the work site immediately prior to the start of application and hourly thereafter until the end of application. DPR believes air temperature for sprinkler applications is a factor that impacts the volatility of Metam and can affect soil moisture content. Growers or pest control businesses would be prohibited from starting or continuing the sprinkler application when the air temperature is greater than 90° F.

DPR is seeking input on the temperature restrictions selected, and the option of establishing the hourly monitoring requirement. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

II. Wind Speed

Growers or pest control businesses applying Metam would be required to monitor the wind speed at the work site immediately prior to the start of application and hourly thereafter until the end of application. DPR believes that some air movement mitigates offsite exposure to peak concentrations of MITC, although strong winds could impact the effectiveness of the sprinkler application. Growers or pest control businesses would be prohibited from starting or continuing the sprinkler application when the wind speed at the work site is greater than 10 miles per hour, as measured by an anemometer positioned four to six feet above the ground.

DPR is seeking input on the wind speed restriction selected, and the procedure for monitoring the wind speed. DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

III. Sprinkler Application Requirements (Metering and Water)

Growers or pest control businesses would be required to meter the Metam application over a minimum of 6 hours and in a minimum of 0.80 inch of water, unless adjustments are necessary based on small acreages to be treated. DPR believes a metering approach results in an even application and prevents the potential off-site movement of higher concentrations if the Metam were applied over a shorter duration.

DPR is seeking input on whether this approach is an effective risk management tool in reducing off-site movement. Is the time period and quantity of water appropriate and workable? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

IV. Sprinkler Application Block Size Limitations

DPR is proposing to restrict the amount of acreage that can be treated over time to protect persons in structures, bystander areas, and agricultural fields. The distance and time selected for block size limitations were based on estimated flux profiles from monitoring data and estimated peak emissions that come off the field over time. DPR would restrict growers from treating more than **25 acres** of an application block within a 24-hour period in a sensitive area (the distance to occupied structures or bystander areas that are $\frac{1}{4}$ mile or less) when multiple post applications water treatments are made; and to restrict growers from treating more than **50 acres** of an application block within a 24-hour period in a standard area (the distance to occupied structures or bystander areas that are greater than $\frac{1}{4}$ mile) when multiple post application water treatments are made. DPR is proposing to lengthen the time interval from 24 hours to 48 hours for scenarios listed above if one post application water treatment is made. DPR believes restricting the acreage that can be treated would reduce the potential exposures to nearby residents and bystanders. Reducing the acreage also has a direct relationship to the buffer zone needed to protect people who are near treated fields.

The 24-hour period represents the time frame from the beginning of application on day one to the start of the next application on day two. The 48-hour period represents the time frame from the beginning of application on day one to the start of the next application on day three.

DPR is seeking input on whether this approach is an effective risk management tool in reducing off-site movement. Are the acreage restrictions adequate and workable? If not, why? Are the time periods adequate and workable? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

Specific Requirements for Soil Injection (Shank) Applications

I. Soil Injection Application Requirements

Growers and pest control businesses making the Metam application would be required to use equipment that is in good repair, and inspect it prior to use to assure it does not leak. The applicator would be required to place the shanks and injector orifices below the soil surface before the metam sodium/potassium mixture flow begins. Before lifting shanks and injector orifices from the soil, the applicator would need to stop the flow to the distribution manifold and allow sufficient time for the lines to clear. The application depth would be restricted to a minimum depth of 3 inches.

DPR believes the use of well-maintained equipment reduces the potential for equipment failure and spills. In addition, keeping the Metam in the ground reduces the potential for off-site movement. These restrictions should play a role in reducing exposures to residents, bystanders, and fieldworkers.

DPR is seeking input on whether following these best management practices are effective in reducing exposures, adequate and workable? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

II. Soil Injection Application Block Size Limitations

DPR is proposing to restrict the amount of acreage that can be treated over time to protect persons in structures, bystander areas, and agricultural fields. The distance and time selected for block size limitations were based on the flux data and peak emissions that come off the field over time. DPR would restrict growers from treating more than **40 acres** of an application block within a 24-hour period in a sensitive area (the distance to occupied structures or bystander areas that are $\frac{1}{4}$ mile or less) when multiple post application water treatments are made. DPR is also proposing to restrict growers from treating more than **80 acres** of an application block within a 24-hour period in a standard area (the distance to occupied structures or bystander areas that are greater than $\frac{1}{4}$ mile) when multiple post application water treatments are made. DPR is proposing to lengthen the time interval from 24 hours to 48 hours for scenarios listed above if one post application water treatment is made. DPR believes restricting the acreage that can be treated would reduce the potential exposures to nearby residents and bystanders. Reducing the acreage also has a direct relationship to the buffer zone needed to protect people who are near treated fields.

The 24-hour period represents the time frame from the beginning of application on day one to the start of the next application on day two. The 48-hour period represents the time frame from the beginning of application on day one to the start of the next application on day three.

DPR is seeking input on whether this approach is an effective risk management tool in reducing off-site movement. Are the acreage restrictions adequate and workable? If not, why? Are the time periods adequate and workable? If not, why? DPR is interested in receiving input on the impacts of this proposed requirement and whether there are any alternative approaches.

Definitions

Application: In this document, application refers to the time required to incorporate metam sodium or metam potassium pesticides into the prepared soil. It is important to note that the time required to apply additional water to the treated soil in order to suppress emission of MITC into the atmosphere is not considered part of the application process. It does, however, fall under the definition of a handler activity.

Application Block: The field location listed in the Restricted Material Permit and as defined by 3 CCR section 6000 as a field or portion of a field treated in a 24-hour period that is typically identified by visible indicators, maps, or other tangible means (also referred to as the treated field). The area of the application block for MITC-generating pesticides may be limited based on availability of water and water application system during the application, and shall be no more than 50 acres for sprinkler applications and 80 acres for soil injection (shank) applications.

Buffer Zone: The area that surrounds a pesticide application block in which certain activities are restricted for a specified period of time to protect people from adverse effects associated with a pesticide application.

Bystander Area: An area, as defined by the commissioner, which may be impacted by a metam sodium/potassium application. These areas include persons inhabiting parks, playgrounds, lakes, reservoirs, bus stops, and other similar areas where groups of people visit.

Metam Sodium/Potassium: Pesticide products that contain metam sodium or metam potassium.

Minimal Crop Residual: Residue (e.g., stalks, foliage, root crowns) from the previous crops that are thoroughly incorporated into the soil to avoid interference with the application.

MITC: Methyl isothiocyanate. Metam sodium/potassium breaks down into a number of compounds. MITC is one of those compounds.

Sensitive Area: An area designated as sensitive due to the close proximity of occupied structures (e.g., residences, employee housing, businesses, schools, convalescent homes, hospitals) and other similar sites determined by the commissioner to the application block to be treated. At minimum, the area contains an application block that is 1/4 mile or less from occupied structures (e.g., residences, employee housing, businesses, schools, convalescent homes, hospitals), bystander areas, and other similar sites determined by the commissioner.

Soil Capping Method: Following a metam sodium/potassium band treatment, a minimum of 4 inches of soil is placed on the bed and compacted using a mechanical device.

Standard Area: An area where the application block is greater than 1/4 mile away from occupied structures (e.g., residences, employee housing, businesses, schools, convalescent homes, hospitals), bystander areas, and other similar sites determined by the commissioner.

Treatment Zone: The depth of intended pest control in the prepared soil.

References

3 CCR section 6432. PERMIT EVALUATION. California Code of Regulations; Title 3, Food and Agriculture; Division 6, Pesticides and Pest Control Operations; Chapter 2, Pesticides, Subchapter 4, Restricted Materials; Article 3, Permit System; 6432, Permit Evaluation.

3 CCR section 6434. NOTICE OF INTENT. California Code of Regulations; Title 3, Food and Agriculture; Division 6, Pesticides and Pest Control Operations; Chapter 2, Pesticides, Subchapter 4, Restricted Materials; Article 3, Permit System; 6434, Notice of Intent.

3 CCR section 6780. ACCIDENT RESPONSE REQUIREMENTS. California Code of Regulations; Title 3, Food and Agriculture; Division 6, Pesticides and Pest Control Operations; Subchapter 3, Pesticide Worker Safety; Article 4, Fumigation; 6780, General Fumigation Safe-Use Requirements.

Gosselin, P. H., (2002) RISK MANAGEMENT DIRECTIVE, letter outlining the Department of Pesticide Regulation's (DPR's) risk management decision related to the development of use restrictions on metam-sodium and other methyl isothiocyanate (MITC)-generating pesticides, Paul H. Gosselin, Chief Deputy Director, DPR, to Interested Parties. December 2, 2002

Rubin, R. L., (2002), Evaluation of Methyl Isothiocyanate (MITC) as a Toxic Air Contaminant, Part C—Human Health Assessment, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, California, August 26, 2002

Russell, M.J., and T.I. Rush (1996) Methyl isothiocyanate: determination of human olfactory detection threshold and human no observable effect level for eye irritation. Sacramento, California: Metam Sodium Task Force. Report No. RR 96-049B. DPR Volume 50150-142 #149369.

Thongsinthusak, T., (2002), Evaluation of Methyl Isothiocyanate (MITC) as a Toxic Air Contaminant, Part B—Public Exposure to Airborne Methyl Isothiocyanate in California, HS-1704, Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, California, August 26, 2002

USDA (1998). Program Aid No 1619, "Estimating soil Moisture by Feel and Appearance," USDA Natural Resources Conservation Service, 1998.

Appendix I

MITC Control Plan

The purpose of the MITC Control Plan is to assure procedures are in place to adequately respond in the event where odors of metam sodium/potassium are detected away from the application site or symptoms were reported, to provide instructions on response procedures to cooperators and employees involved in metam sodium/potassium applications and post-application monitoring, notify appropriate governmental, grower and pest control business and registrant/dealer personnel. The plan shall be on site during the application and post-application monitoring period. Personnel should receive annual training in response procedures.

Security of Treatment Site

1. Someone must be at the field site continuously during application. Emergency PPE (coveralls over long sleeve shirt and pants, socks, chemical resistant boots, chemical resistant gloves, and a full face respirator or half face respirator and non-vented goggles) must be available at all times.
2. Metam sodium/potassium posting signs must be in place at all points of field entry and every 200 feet along public access roads.
3. Metam sodium/potassium storage tanks must be locked when not in use.

Response for handling – Metam Sodium/Potassium Leaks and Spills

1. Evacuate personnel from the leak or spill area. Shut down the application system to stop the leak. If possible, determine wind direction and move personnel and anyone injured upwind and away from the impacted area. Establish control of the area.
2. Immediately administer first aid to anyone who may be injured and contact the appropriate emergency personnel by dialing 9-1-1.
3. Wear emergency personal protective equipment (PPE) and clothing required by the label when assisting with repair of leaks and small spill clean up. For large spills, see #6 below. Emergency PPE must be readily accessible at all times and include coveralls over long sleeve shirt and pants, socks, chemical resistant boots, chemical resistant gloves, and a full face respirator or half face respirator and non-vented goggles.
4. For small leaks from application and chemigation equipment, put a container under the leak and catch leaking metam sodium/potassium. Turn off any equipment valves that may affect the leak. Repair the leak. Return caught material to tank or dispose of properly. Clean up the contaminated area.
5. For small spills, contain the material. If puddles are present, clean it up with absorbent material and dispose of properly. If the soil is contaminated, determine whether removal is necessary. If contaminated soil must be removed, dispose of properly.
6. For large spills, notify HazMat or Fire Department personnel immediately. If properly trained in HazMat responses, wear appropriate PPE (chemical resistant suit, gloves and boots, and self-contained breathing apparatus). Dike the area to prevent spreading and further environmental contamination. If metam sodium/potassium has pooled within the dike area, then use a tank truck with vacuum hoses to remove it. Remove the contaminated soil and dispose of properly. The plan may include the assistance of an environmental service company that could provide support in large spill emergencies.
7. Notify the appropriate personnel (see Notification section below).

Mitigation of Off-Site MITC Exposures

If odors are detected and/or eye, nose and/or throat irritation is experienced during the application in the buffer zone area:

1. The operator of the property or pest control business applying metam sodium/potassium shall assure employees at the worksite wear a full-face respirator.
2. Stop the application, and apply a water application (to provide a layer of water) or conduct other appropriate suppression measures that are available for this application method.
3. Determine the cause of odor or MITC exposure, correct the problem or wait until conditions are suitable for re-starting the application.
4. If off-site movement may move outside buffer zone area, contact appropriate personnel.

If odors are detected and/or symptoms are experienced during the post application monitoring in the buffer zone area:

1. The operator of the property or pest control business applying metam sodium/potassium shall assure employees at the worksite wear a full-face respirator.
2. Apply a water application (to provide a layer of water) or conduct appropriate suppression measures that are available for this application method.
3. If you are notified or become aware of bystander exposure, call 9-1-1, and perform MITC suppression measures.

Notification of Appropriate Persons/Agencies/Companies

Spills/Leaks/Mitigation of Off-Site MITC

Grower:

Name _____ Telephone _____

On Site Supervisor:

Name _____ Telephone _____

Irrigation Supervisor

Name _____ Telephone _____

Metam Distributor

Name _____ Telephone _____

Pest Control Business if Custom Application

Name _____ Telephone _____

County Agricultural Commissioner's Office (Large Spills/Health Incidents)

Name _____ Telephone _____

Metam Sodium/Potassium Manufacturer

Name _____ Telephone _____

Emergency Services

Fire - 9-1-1

County Sheriff - 9-1-1

Ambulance - 9-1-1

Highway Patrol - 9-1-1

Doctor:

Name:

Address:

Phone:

Hospital:

Name:

Address:

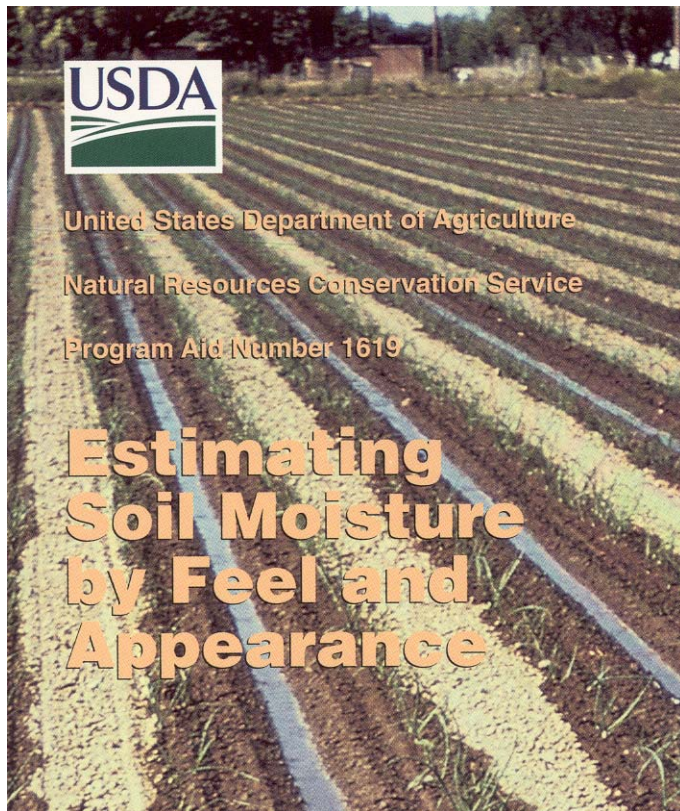
Phone:

Appendix II
Estimating Soil Moisture by Feel and Appearance
USDA 1998

See next page

Estimating Soil Moisture by Feel and Appearance

Irrigation Water Management (IWM) is applying water according to crop needs in an amount that can be stored in the plant root zone of the soil.



1. Obtaining a soil sample at the selected depth using a probe, auger, or shovel;
2. Squeezing the soil sample firmly in your hand several times to form an irregularly shaped "ball";
3. Squeezing the soil sample out of your hand between thumb and forefinger to form a ribbon;
4. Observing soil texture, ability to ribbon, firmness and surface roughness of ball, water glistening, loose soil particles, soil/water staining on fingers, and soil color. [Note: A very weak ball will disintegrate with one bounce of the hand. A weak ball disintegrates with two to three bounces;
5. Comparing observations with photographs and/or charts to estimate percent water available and the inches depleted below field capacity.

Example:

Sample Depth	Zone	USDA Texture	AWC*for Zone	Soil Moisture Depletion**	Percent Depletion
6"	0-12"	sandy loam	1.4"	1.0"	70
18"	12-24"	sandy loam	1.4"	.8"	55
30"	24-36"	loam	2.0"	.8"	40
42"	36-48"	loam	<u>2.0"</u> 6.8"	<u>.5"</u> 3.1"	25

Result: A 3.1" net irrigation will refill the root zone.

* Available Water Capacity

** Determined by "feel and appearance method"

The "feel and appearance method" is one of several irrigation scheduling methods used in IWM. It is a way of monitoring soil moisture to determine when to irrigate and how much water to apply. Applying too much water causes excessive runoff and/or deep percolation. As a result, valuable water is lost along with nutrients and chemicals, which may leach into the ground water.

The feel and appearance of soil vary with texture and moisture content. Soil moisture conditions can be estimated, with experience, to an accuracy of about 5 percent. Soil moisture is typically sampled in 1-foot increments to the root depth of the crop at three or more sites per field. It is best to vary the number of sample sites and depths according to crop, field size, soil texture, and soil stratification. For each sample the "feel and appearance method" involves:

Available Water Capacity (AWC) is the portion of water in a soil that can be readily absorbed by plant roots of most crops.

Soil Moisture Deficit (SMD) or Depletion is the amount of water required to raise the soil-water content of the crop root zone to field capacity.

Appearance of fine sand and loamy fine sand soils at various soil moisture conditions.

Available Water Capacity 0.6-1.2 inches/foot

Percent Available: Currently available soil moisture as a percent of available water capacity.

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

**0-25 percent available
1.2-0.5 in./ft. depleted**

Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure. (Not pictured)



**50-75 percent available
0.6-0.2 in./ft. depleted**

Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.



**25-50 percent available
0.9-0.3 in./ft. depleted**

Slightly moist, forms a very weak ball with well-defined finger mark



**75-100 percent available
0.3-0.0 in./ft. depleted**

Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon

**100 percent available
0.0 in./ft. depleted (field capacity)**

Wet, forms a weak ball, moderate to heavy soil/water coating on fingers, wet outline of soft ball remains on hand. (Not pictured)

Appearance of sandy loam and fine sandy loam soils at various soil moisture conditions.

Available Water Capacity **1.3-1.7 inches/foot**

Percent Available: Currently available soil moisture as a percent of available water capacity.

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available **7-1.0 in/ft. depleted**

Dry, forms a very weak ball, aggregated soil grains break away easily from ball. (Not pictured)



25-50 percent available **1.3-0.7 in/ft. depleted**

Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.



50-75 percent available **0.9-0.3 in./ft. depleted**

Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color, will not slick.



75-100 percent available **0.4-0.0 in./ft. depleted**

Wet, forms a ball with wet outline left on hand, light to medium staining on fingers, makes a weak ribbon between the thumb and forefinger.

100 percent available **0.0 in./ft. depleted (field capacity)**

Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. (Not pictured)

Appearance of sandy clay loam, loam, and silt loam soils at various soil moisture conditions.

Available Water Capacity **1.5-2.1 inches/foot**

Percent Available: Currently available soil moisture as a percent of available water capacity.

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available
2.1-1.1 in./ft. depleted

Dry, soil aggregations break away easily, no staining on fingers, clods crumble with applied pressure. (Not pictured)



25-50 percent available
1.6-0.8 in./ft. depleted

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.



50-75 percent available
1.1-0.4 in./ft. depleted

Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.



75-100 percent available
0.5-0.0 in./ft. depleted

Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.

100 percent available
0.0 in./ft. depleted (field capacity)

Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. (Not pictured)

Appearance of clay, clay loam, and silt clay loam soils at various soil moisture conditions.

Available Water Capacity **1.6-2.4 inches/foot**

Percent Available: Currently available soil moisture as a percent of available water capacity.

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available **2.4-1.2 in./ft. depleted**

Dry, soil aggregations separate easily, clods are hard to crumble with applied pressure. (Not pictured)



25-50 percent available **1.8-0.8 in./ft. depleted**

Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.



50 - 75 percent available **1.2-0.4 in./ft. depleted**

Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.



75-100 percent available **0.6-0.0 in./ft. depleted**

Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.

100 percent available **0.0 in./ft. depleted (field capacity)**

Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky. (Not pictured)

Guidelines for Estimating Soil Moisture Conditions

	Coarse Texture- Fine Sand and Loamy Fine Sand	Moderately Coarse Texture Sandy Loam and Fine Sandy Loam	Medium Texture - Sandy Clay Loam, Loam, and Silt Loam	Fine Texture- Clay, Clay Loam, or Silty Clay Loam
Available Water Capacity (Inches/Foot)				
	0.6-1.2	1.3-1.7	1.5-2.1	1.6-2.4
Available Soil Moisture Percent	Soil Moisture Deficit (SMD) in inches per foot when the feel and appearance of the soil are as described.			
0-25	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure. SMD 1.2-0.5	Dry, forms a very weak ball, aggregated soil grains break away easily from ball. SMD 1.7 -1.0	Dry. Soil aggregations break away easily. no moisture staining on fingers, clods crumble with applied pressure. SMD 2.1-1.1	Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure SMD 2.4-1.2
25-50	Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remain on fingers. SMD 0.9-0.3	Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away. SMD 1.3-0.7	Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away. SMD 1.6-0.8	Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure SMD 1.8-0.8
50-75	Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon. SMD 0.6-0.2	Moist, forms a ball with defined finger marks. very light soil/water staining on fingers. darkened color, will not slick. SMD 0.9-0.3	Moist, forms a ball, very light water staining on fingers, darkened color, pliable, forms a weak ribbon between thumb and forefinger. SMD 1.1- 0.4	Moist. forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger. SMD 1.2-0.4
75-100	Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon. SMD 0.3-0.0	Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers, makes a weak ribbon between thumb and forefinger. SMD 0.4-0.0	Wet, forms a ball with well defined finger marks, light to heavy soil/water coating on fingers, ribbons between , thumb and forefinger. SMD 0.5 -0.0	Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger. SMD 0.6-0.0
Field Capacity (100 %)	Wet, forms a weak ball, moderate to heavy soil/ water coating on fingers, wet outline of soft ball remains on hand. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky. SMD 0.0

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To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC, 20250-9410 or call 202-720-5964 (voice or TDD). USDA is an equal opportunity provider and employer.

Appendix III

Metam Sodium/Potassium Monitoring Form

Grower Name: _____ Permit Number: _____

Metam Certified Person: _____ Applicator / P.C.O.: _____

Field Location / Site Id. #: _____ Acres Treated: _____

Treatment Method (circle method) soil injection (shank) sprinkler

Soil Moisture (% field capacity) _____ % Soil Temperature (3" depth): _____

Water Pressure: _____ (pounds per square inch) Irrigation Rate (inch/hour):

Irrigation Set Number: _____ Nozzle Size: _____

SPRINKLER APPLICATION SUMMARY

Set Number	Lines/Set	Length/Line	Start of Injection	End of Injection	Start of Water Application	End of Water Application

SPRINKLER AND SHANK APPLICATION SUMMARY

Date: _____	Time	Wind Speed (MPH)	Wind Direction (from)	Air Temp (Sprinkler only)	Unusual Conditions
Pre-Application					
Hour 1					
Hour 2					
Hour 3					
Hour 4					
Hour 5					
Hour 6					
Hour 7					
Hour 8					
Hour 9					
Hour 10					
End Application.					

SPRINKLER AND SHANK POST-APPLICATION MONITORING

Date: _____	Time	Wind Speed (MPH)	Wind Direction (from)	Unusual Conditions
2 hours post app.				
4 hours post app.				
6 hours post app.				
8 hours post app.				
10 hours post app.				
12 hours post app.				
School Sites				
14 hours post app.				
16 hours post app.				
18 hours post app.				
20 hours post app.				
22 hours post app.				
24 hours post app.				
26 hours post app.				
28 hours post app.				
30 hours post app.				
32 hours post app.				
34 hours post app.				
36 hours post app.				
38 hours post app.				
40 hours post app.				
42 hours post app.				
44 hours post app.				
46 hours post app.				
48 hours post app.				

SPRINKLER AND SHANK POST-APPLICATION WATER TREATMENTS

Date/ Time Started	Date/Time Completed	Water Application (Inches)	Comments

Appendix IV Buffer Zone Tables

**Table 1. Buffer Zone Values for Sprinkler Applications
Minimum of Two Water Applications**
(Buffer Zone values are listed in feet)

Acres Treated	320 lbs active ingredient	240 lbs active ingredient	160 lbs active ingredient	80 lbs active ingredient
1	500	500	500	200
5	500	500	500	500
10	500	500	500	500
15	500	500	500	500
20	700	600	500	500
25	800	700	500	500
30	1,000	800	600	500
35	1,200	900	700	500
40	1,320	1,000	800	500
45	1,500	1,100	900	500
50	1,760	1,320	1,000	600

Appendix IV Buffer Zone Tables – Continued

**Table 2. Buffer Zone Values for Sprinkler Applications
One Post Application Water Treatment**
(Buffer Zone values are listed in feet)

Acres Treated	320 lbs active ingredient	240 lbs active ingredient	160 lbs active ingredient	80 lbs active ingredient
1	800	600	500	500
5	1,760	1,320	800	500
10	2,200	1,760	1,320	700
15	2,640	2,200	1,500	800
20	Prohibited	2,640	1,760	1,000
25	Prohibited	Prohibited	2,000	1,200
30	Prohibited	Prohibited	2,200	1,320
35	Prohibited	Prohibited	2,400	1,500
40	Prohibited	Prohibited	2,640	1,760
45	Prohibited	Prohibited	Prohibited	1,900
50	Prohibited	Prohibited	Prohibited	2,000

Appendix IV Buffer Zone Tables - Continued

Table 3. Buffer Zone Values for Soil Injection (Shank) Applications
Minimum of Two Post Application Water Treatments
(Buffer Zone values are listed in feet)

Acres Treated	320 lbs active ingredient	240 lbs active ingredient	160 lbs active ingredient	80 lbs active ingredient
1	500	500	500	200
5	500	500	500	500
10	500	500	500	500
15	500	500	500	500
20	500	500	500	500
25	700	600	500	500
30	800	700	500	500
35	900	800	600	500
40	1,000	900	700	500
45	1,200	1,000	750	500
50	1,320	1,100	800	500
55	1,500	1,200	900	500
60	1,760	1,320	1,000	600
65	2,000	1,500	1,200	700
70	2,200	1,760	1,320	800
75	2,400	2,000	1,500	900
80	2,640	2,200	1,760	1,000

Appendix IV Buffer Zone Tables – Continued

**Table 4. Buffer Zone Values for Soil Injection (Shank) Applications
One Post Application Water Treatment** (Buffer Zone values are listed in feet)

Acres Treated	320 lbs active ingredient	240 lbs active ingredient	160 lbs active ingredient	80 lbs active ingredient
1	600	500	500	500
5	1,320	1,000	800	500
10	1,760	1,320	1,000	700
15	2,200	1,760	1,320	1,000
20	2,640	2,200	1,760	1,320
25	Prohibited	2,640	2,000	1,500
30	Prohibited	Prohibited	2,200	1,760
35	Prohibited	Prohibited	2,400	2,000
40	Prohibited	Prohibited	2,640	2,200
45	Prohibited	Prohibited	Prohibited	2,400
50	Prohibited	Prohibited	Prohibited	2,640
55	Prohibited	Prohibited	Prohibited	Prohibited
60	Prohibited	Prohibited	Prohibited	Prohibited
65	Prohibited	Prohibited	Prohibited	Prohibited
70	Prohibited	Prohibited	Prohibited	Prohibited
75	Prohibited	Prohibited	Prohibited	Prohibited
80	Prohibited	Prohibited	Prohibited	Prohibited